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GENETIC STRATEGIES TO INCREASE PLANT QUALITY AND MODULATE CONTENT OF VALUABLE COMPOUNDS

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Improvement of plant traits has been a major goal of human kind since plant domestication. At first, an empiric approach was applied, consisting in the stabilisation of useful traits arisen from spontaneous mutations. More recently, breeders have combined modern genetics with biodiversity to increase plant quality. In some instances natural variation has been increased by inducing mutations, both chemically and physically. In the very last few years, tools at hands for breeders have seen a burst, increasing enormously the chances to manipulate plant metabolism (1,2). Extensive gene mapping and detailed description of whole genome of model and agronomically important species, combined with genetic engineering, have speeded up traditional breeding. Although genetic engineering allows the transfer of traits among different species, the resulting transgenic plants are not always accepted by the consumer. A powerful tool for plant improvement, that avoids genetic transformation, is represented by the combination of traditional mutagenesis with functional genomics (3).

This nontransgenic reverse genetics technology, referred to as TILLING, generates a large amount of variation in the genome and gives rise to large allelic series in target genes, which can then be the starting material for crop improvement.

Research projects carried out in our group, are mostly focused on the improvement of beans, the most cultivated legume for human consumption. One of the nutritional traits under study is the phytate content of the seed. The effect of phytic acid in reducing mineral bioavailability in plant food is well documented. Both the classical and the TILLING approach are being exlpoited in our laboraory to identify mutants with an altered phytate content.

Other major determinants of nutritional quality of bean seeds are the storage proteins phaseolin and the proteins of the lectin family. Taking advantage of the large variation in storage proteins found in bean genotypes, we are producing a number of breeding lines with different protein profiles, to test the importance of single protein classes on seed quality.

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